

His work on electric radiation has been collected in a book, "L'Ottica delle oscillazioni elettriche," Bologna, 1897. He rendered fundamental service to exact experiment on this subject by simplifying the practical conditions of the problem; and he applied his improved apparatus to numerous investigations on the behaviour of electromagnetic waves, of short and therefore manageable wavelength, under very varied conditions, on their absorption, polarisation, reflection and refraction, and on the behaviour of dielectrics in the field of radiation. This work entitles him to a high place among those who developed the lines of experimental investigation opened up by the great discoveries of Hertz.

More recently he has contributed substantially to the study of the phenomena of radio-activity and the related ionisations.

THE DEATH-KNELL OF THE ATOM.¹

Old Time is a-flying; the atoms are dying;

Come, list to their parting oration:—

"We'll soon disappear to a heavenly sphere
On account of our disintegration.

"Our action's spontaneous in atoms uranious

Or rarious, actinious or thorious:

But for others, the gleam of a heaven-sent beam
Must encourage their efforts laborious.

"For many a day we've been slipping away

While the savants still dozed in their slumbers;
Till at last came a man with gold-leaf and tin can
And detected our infinite numbers."

Thus the atoms in turn, we now clearly discern,

Fly to bits with the utmost facility;
They wend on their way, and in splitting, display
An absolute lack of stability.

'Tis clear they should halt on the grave of old Dalton

On their path to celestial spheres;
And a few thousand million—let's say a quadrillion—
Should bedew it with reverent tears.

There's nothing facetious in the way that Lucretius

Imagined the Chaos to quiver;
And electrons to blunder, together, asunder,
In building up atoms for ever!

W. R.

NOTES.

THE Hayden memorial gold medal has been awarded by the Academy of Natural Sciences of Philadelphia to Mr. C. D. Walcott, director of the U.S. Geological Survey, in recognition of the value of his individual contributions to geological science.

THE University of Basle, to which the late Prof. Dr. Georg W. A. Kahlbaum was attached for nearly twenty years, has received the sum of 100,000 francs from the mother of the deceased professor. Further, Prof. Kahlbaum's scientific library and physical instruments are also to be handed to the university.

FROM Berlin we learn, according to the *Chemiker-Zeitung*, that the German State grant for the support of scientific, technical, and similar undertakings is to be increased by 115,000 marks. The sum of 179,500 marks is to be spent upon increasing the accommodation for the permanent exhibition devoted to the interests of the working classes; 120,000 marks to be a first instalment for an

¹ Sung at the Chemical Laboratory dinner at University College, November 17.

investigation of sleeping sickness; 30,000 marks to be devoted to the development of the Starkstrom-laboratory of the Reichsanstalt; 43,850 marks to be contributed to the kite station on Lake Constance for experimental investigations of the higher air strata.

THE annual conference of the Pharmaceutical Society will be held in Birmingham in the week beginning July 23, 1906.

FOR the erection of a monument to Franz Reuleaux in the Charlottenburg Technical School, an appeal for subscriptions has been issued by the engineering department of the school.

MR. F. W. DYSON, F.R.S., chief assistant, Royal Observatory, Greenwich, has been appointed Astronomer Royal for Scotland, and also professor of practical astronomy, Edinburgh University, in succession to the late Dr. Copeland.

AN exhibition of electrical, optical, and other physical apparatus has been arranged by the Physical Society, and will be held on Friday evening, December 15, at the Royal College of Science, South Kensington. Admission will be by ticket only.

It is reported, *Science* says, that the Mexican Astronomical Society has awarded the prize offered by the Bishop of Leon for some notable astronomical discovery to Prof. W. H. Pickering, of Harvard College Observatory, for the discovery of the tenth satellite of Saturn.

AN archæological museum, which will devote special attention to Indo-Chinese matters, has been established by the French Government at Pnompenh. The museum will be under the scientific control of the École française d'Extrême-Orient, the chief of the archæological department of which school will act as director of the new museum.

A DESCRIPTION is given in the *Engineer* of December 1 of some interesting machine-tools, formerly the property of James Nasmyth, lately placed on view in the southern galleries of the Victoria and Albert Museum. Although associated primarily with the invention of the steam-hammer, James Nasmyth did valuable work in the improvement of machine-tools.

AN extensive landslip has occurred in the Danish island of Möen, destroying part of the beautiful scenery along Lille Klint. From the beach, steep slopes of Boulder-clay, thickly wooded, rise about 250 feet. The right bank of the valley from Liselund Chateau, and the coast-cliff for some 400 yards to the south of it, in all some fifteen or twenty acres of woodland, are described as having sunk bodily. The sea had been encroaching, but underground water is regarded as the cause.

A *Times* correspondent reports that a local Greek newspaper publishes details of the earthquake of November 8, which caused great damage to the various monasteries on Mount Athos. The shocks, which were extremely violent, occurred in the night. None of the monasteries escaped without serious injury. The shocks were not confined to the colony of monks. At Caryes the post-office, the police station, and other public buildings have been ruined, and at Cassandra, Jerissos, Gomate, and other villages within the districts affected the churches and many houses have been destroyed.

IN the course of a lecture delivered at the Armstrong College, Newcastle-on-Tyne, on December 2, the Hon. C. A. Parsons, F.R.S., dealt with the application of turbines to Atlantic passenger steamers, and described the

recent trials of the Cunarder *Carmania* with turbine engines, and her sister ship, *Caronia*, with reciprocating engines, the latter being one of the most economical vessels ever built. The *Carmania* beat the *Caronia* by one knot, and was at least 16 per cent. more economical than her sister vessel driven by reciprocating engines. The *Carmania* is the first example on so large a scale, and it may be reasonably expected that improvements in detail will increase still further the excellent results she realised.

MAJOR MOODIE, Governor of Hudson Bay, has received a communication, dated May 22 last, from Captain R. Amundsen's Norwegian Expedition to the North Pole. The *Gjoa*, with the expedition on board, spent last winter in Simpson Strait, King William's Land, 400 miles north of Fullerton. Captain Amundsen dispatched letters from Fullerton in November, 1904, reporting the expedition well, but short of dogs. The messenger reached Governor Moodie's headquarters on March 18 of this year, and on March 26 he started back with ten dogs. The messenger reached Captain Amundsen's party on May 22, and then returned to Fullerton with a second letter. This reported that the observations of the party had been conducted undisturbed since the establishment of the magnetic station in October, 1903.

At a meeting of the council of the Invalid Children's Aid Association, held last week, Sir William Broadbent delivered an address on the tuberculous children of the metropolis, in which he pointed out that while consumption, the most prevalent form of tuberculous disease, has steadily diminished year by year for the last thirty years, there has been no corresponding diminution in the death-rate of tuberculous affections specially incident to infancy and early childhood. He strongly urged the establishment of country and sea-side homes where delicate children in the pre-tuberculous stage, or those actually suffering from tuberculosis, could receive the benefits of the open-air treatment. After alluding to the sanitary defects of tenements in which the poor too often have to live, he pointed out that the greatest safeguard against tuberculosis in early life, and against infantile mortality generally, is that the child should be suckled by the mother.

THE council of the Iron and Steel Institute has arranged that the annual general meeting of the institute shall be held in London on May 10-11, 1906. In place of the usual autumn meeting, a joint meeting with the American Institute of Mining Engineers will be held in London on July 23-28. It is intended during the week following to give the American visitors an opportunity of seeing some of the iron-making districts. It is anticipated that the visiting party will include many of the leading ironmasters who entertained the Iron and Steel Institute in America in 1890 and 1904. The Lord Mayor of London has consented to act as chairman of the London reception committee, and to give an evening reception at the Mansion House.

LECTURES on agricultural subjects are given in connection with the County Technical Laboratories, Chelmsford, on Friday afternoons, which is the market day of the town. The lectures last about half an hour, and are intended for farmers and others interested in agriculture. A discussion follows the lecture. The subjects for the December meetings, with the lecturers dealing with them, are as follows:—The field culture of the potato, by Mr. A. Steel; England as a producer of sugar from home-grown sugar beetroot, by Mr. Sigmund Stein; some agricultural facts and figures, by Mr. R. H. Rew. This excellent plan of making it easy for farmers to hear of

the results of modern agricultural research deserves to be successful, and could be adopted with advantage in other agricultural centres.

At a general monthly meeting of the members of the Royal Institution, held on Monday, special thanks were returned to Dr. Ludwig Mond, F.R.S., for his donation of 500*l.* to the fund for the promotion of experimental research at low temperatures. It was announced that the managers had elected Prof. W. Stirling Fullerton professor of physiology. The following are among the lecture arrangements at the Royal Institution before Easter:—A Christmas course of six illustrated lectures, adapted to a juvenile auditory, by Prof. H. H. Turner, on astronomy; Prof. E. H. Parker, three lectures on impressions of travel in China and the Far East; Prof. William Stirling, six lectures on a physiological subject; Dr. J. E. Marr, three lectures on the influence of geology on scenery (the Tyndall lectures); Mr. Benjamin Kidd, two lectures on the significance of the future in the theory of evolution; Mr. Francis Darwin, three lectures on the physiology of plants; Prof. B. Hopkinson, three lectures on internal combustion engines; Mr. J. W. Gordon, two lectures on advances in microscopy; and Prof. J. J. Thomson, six lectures on the corpuscular theory of matter. The Friday evening meetings will commence on January 19, when Prof. J. J. Thomson will deliver a discourse on some applications of the theory of electric discharge to spectroscopy. Succeeding discourses will probably be given by Prof. S. P. Thompson, Mr. H. F. Newall, Mr. W. C. D. Whetham, Dr. R. Caton, Dr. Hutchison, Sir Andrew Noble, Bart., Prof. P. Zeemann, Mr. W. B. Hardy, and others.

THE Russian physiologist, Prof. Iwan Michaelowitsch Ssetchenoff, emeritus professor of the University of Moscow, who died on November 15, was born in 1829. He first attended an engineering school in St. Petersburg, but subsequently took up medicine, and, after passing his final examination in Moscow in 1856, studied for some time in Germany. By his interesting paper on brain reflex he first attracted the serious attention of his colleagues of the Medico-chirurgical Academy in St. Petersburg, in which he was appointed an assistant professor of physiology in 1860, but on account of the strict censure to which his further work was submitted, Ssetchenoff published the results of his scientific investigations in Germany. A pupil of Du Bois-Reymond, Helmholtz, Hoppe-Seyler, and Ludwig, he always remained in direct connection with European scientific circles. The greatest services which Ssetchenoff rendered to science lie in the province of physiological chemistry, as, for instance, his works on the absorption of carbon dioxide by the blood. A complete list of his numerous researches would clearly testify to his many-sidedness and breadth of view. Moreover, he earnestly endeavoured to popularise his special science to the Russian mind by presenting it in an easily intelligible form in such well written and well reviewed works as his "Physiological Studies," "Physiology of the Vegetable Processes," "Psychological Studies," &c. In 1870 Ssetchenoff was appointed professor of physiology in the University of Odessa, and in 1876 to a similar post in St. Petersburg, which he held until 1889. He then went to Moscow, where he first acted as privatdocent and afterwards (1891) as professor, retiring in 1896.

IN the second part of his article on the histology of cartilage and kindred tissues, published in vol. lxxx., part ii., of the *Zeitschrift für wissenschaftliche Zoologie*, Mr. J. Schaffer discusses these structures in the hag-fish (*Myxine*), with special reference to the cranial skeleton of that genus, adding an appendix on the cartilage of the

lampreys. The organisation of the "bear-animalcules," or Tardigrada, those microscopic creatures found in damp moss and the gutters of roofs, forms the subject of an article by Mr. A. Basse; while the third and last communication is the first portion of a memoir by Mr. S. Hlava on the Radiata, the author dealing in this instance with the anatomy of *Conochiloides natans*.

In an important article on the cranial nerve-components of the lamprey (*Petromyzon*), published in *Gegenbaur's Morphologisches Jahrbuch*, vol. xxxiv., part ii., Mr. J. B. Johnston shows that the general arrangement is similar to what obtains in fishes, although with certain markedly primitive features. As the result of a study of the visual organs of the ascidians of the *Salpa* group, Mr. W. Redikorzen arrives at the conclusion that the primitive chordates possessed a series of paired organs of this nature extending from the head to the tail—one pair to each body-segment. Moreover, the pineal eye was certainly in the first instance a dual structure, but later its two elements coalesced and subsequently degenerated. This segmental ocular type has entirely disappeared from vertebrates, and is now represented only by traces among the lower groups. The other papers in the same issue include one by Mr. T. Mollison on the dorsal gland of *Dendrohyrax*, and a second by Mr. J. Böhm on the reproductive organs of the sheep.

In the November issue of the *Zoologist* Mr. G. Renshaw resumes his interesting series of "obituaries" of exterminated animals, dealing in this instance with the Réunion starling, the sole representative of the genus *Fregilupus*. Easily recognised by its parti-coloured plumage and long crest, this bird was probably discovered by Flacourt in the middle of the seventeenth century. In the early part of the last century it was abundant, but in 1833 had become extremely scarce, and by about 1860 had probably ceased to exist even in its last refuge in the interior of the island. Twenty-one skins, of which one is in the Natural History Museum (although not shown to the public), and two skeletons, of which one is at Cambridge, are all the relics of this interesting species Mr. Renshaw can identify. In another paper Dr. J. Murie discusses the flying-fish captured in September last in a back-water connected with the Medway estuary. It is believed to belong to *Exocoetus lineatus*, a species not previously recorded as an occasional straggler into British waters.

The almost complete shell of a large Cretaceous turtle from Kansas has afforded Mr. G. R. Wieland the opportunity of enlarging our knowledge of the extinct genus *Toxochelys*, his communication on the subject being published in the November issue of the *American Journal of Science*. The structure of the shell agrees with that of certain extinct representatives of the *Chelonidæ* (*Lytoloma*), but the skull approximates to that of the *Chelydridæ*. That the genus should be classed with the true turtles the author is convinced, although he believes the limbs to have been independently modified for swimming. The most interesting part of the paper relates, however, to certain bony elements overlying the junctions between the neural bones of the carapace, and it is suggested that these, which may have been more extended in other types, may represent the mosaic-like shell of the leathery turtles (*Dermochelyidæ*). If this suggestion be well founded, the puzzle of the origin of the carapace of *Dermochelys* will be practically solved.

THE *Comptes rendus* of the zoological congress held at Berne last year contains the full report of a series of experiments undertaken by Mr. H. Piéron with the view of ascertaining the seat of the recognition-sense among ants.

The theory of a "language-sense" resident in the antennæ is rejected by the author, to some extent on the ground that these organs are employed in feeling objects of every kind, animate and inanimate. On the other hand, it is inferred that these organs are endowed with an olfactory sense, on which depends mutual recognition among ants. As is well known, ants not only of different species, but of different communities of the same species, display marked hostility to one another. By making an infusion of ants of one particular community, and anointing the neuters of another community with this infusion, it was found that in most instances the hostile ants thus treated were not attacked by the members of the community from which the infusion was made, this immunity from attack lasting only so long as the influence of the infusion persisted. On this and other experiments of a kindred nature the author's conclusions are mainly based. But to connect these experiments with the antennæ, an ant was deprived of those appendages, when it was found to attack friends and foes alike. Mr. Piéron has also favoured us with a copy of another paper, from the *Bulletin de l'Institut psychologique* for 1904, on the rôle of the muscular sense in determining orientation among ants.

THE experimental station at Peradeniya, Ceylon, has rapidly grown into public favour, and large numbers of agriculturists visit the station to get practical lessons in their craft. From the annual report of the controller, Mr. H. Wright, published as vol. iii., No. 10, of the Circulars of the Royal Botanic Gardens, it will be seen that a considerable amount of time has been devoted to the subject of green manures. While the first object consists in growing a crop to turn into the soil, the additional advantage possessed by leguminous plants of fixing free nitrogen has led to their almost exclusive use. In a tropical country green manures also prevent erosion of the soil by heavy rain and the baking of the surface by the hot sun. *Crotalaria striata* is strongly recommended for tea estates, since it produces a heavy crop. A plant of a different kind is the thornless dadaps, *Erythrina lithosperma*, from which cuttings five feet long planted in the rainy season gave a substantial yield. The Pondicherry variety of groundnut has also proved useful.

In the report of the director of the Mineralogical Survey contained in the Ceylon Administration Reports much valuable information is given by Mr. A. K. Coomaraswamy and Mr. James Parsons regarding the occurrence of corundum, of minerals containing rare earths, of precious stones, of crystalline limestone, of mica, and of graphite. With the aid of numerous illustrations, interesting descriptions are also given of the native Sinhalese manufacture of iron and steel, and of the washing of gem-bearing gravels. The minerals containing rare earths have been derived from intrusive granite rocks. Thorianite containing more than 70 per cent. of thorium and 12 per cent. to 15 per cent. of uranium oxide occurs in moderate quantities near Kondrugala. The whole amount obtained hitherto is less than 30 cwt., and it is doubtful whether any very extensive deposit occurs. Thorite, allanite, and minerals of the samarskite group have also been found. The gems met with are transparent and well coloured varieties of corundum, spinel, zircon, tourmaline, topaz, garnet, chrysoberyl, cordierite, amethyst, felspar, and beryl. Many of these are exhibited in the mineral gallery of the museum attached to the survey, and the director is making strenuous endeavours to get together a thoroughly representative collection which can always be consulted by visitors to Ceylon.

A USEFUL series of memoirs is being published monthly in the *Bulletin du Musée océanographique de Monaco*. In No. 44, for October, Prof. Hergesell discusses some future problems of maritime meteorology; by this name he refers to the meteorological phenomena of the atmosphere over the oceans. He remarks that if our knowledge is well advanced over the land, it is much less so over the oceans, and that our knowledge over the sea is due to a great extent to such expeditions as those of the *Challenger*, *Gazelle*, and *Valdivia*. Others might have been cited, e.g. the Austrian expedition of the *Novara* in 1857-9. But we cannot help remarking that the meteorology over the oceans might be considered as fairly well defined, owing to the labours during the last fifty years of such men as Maury in the United States, FitzRoy and Toynbee in this country, Leverrier and Brault in France, Buys Ballot and Andrau in Holland, Neumayer in Germany, and, of course, including their successors in the central meteorological offices of the respective countries. But while much has been done in the investigation of the upper air over the land by the use of kites and balloons, both manned and unmanned (or "sounding" balloons), and some surprising results have been obtained, little has yet been done in this respect over the oceans. The balloon ascents over the land have shown, for instance, that there is a warm stratum of air at a height of about 11 kilometres; that the decrease of temperature with altitude ceases more or less abruptly, and that the temperature actually increases for a further height of several kilometres. This zone of inversion is probably intimately connected with the general circulation of the atmosphere, and it is most important to know the exact conditions over the ocean, especially in equatorial and certain other localities. We are glad to see that the Prince of Monaco has succeeded in interesting the Emperor of Germany in these questions, and that the cooperation of the German Navy in elucidating them appears to be assured.

Of the papers read at the optical convention in June last, a number of those having a special bearing on the microscope are abstracted in the *Journal of the Royal Microscopical Society* for October. In one of these papers, dealing with equivalent planes of optical instruments, Mr. Conrad Beck gives a simple explanation of the why and wherefore of the particular arrangement of lenses adopted in the compound microscope. A high-power microscope may have an equivalent focal length of only a few thousandths of an inch, but the plan of using lenses separated by large intervals gives an instrument in which the equivalent planes (i.e. the principal planes) are outside the system of lenses, thus allowing sufficient working distance between the front lens and the object.

In connection with Prof. Paul Harzer's recent communication to the British Association (*vide NATURE*, October 26), we read with considerable interest an address delivered by him at the University of Kiel on the Emperor's last birthday, published by Lipsius and Tischer, of Kiel, dealing with the development of exact sciences in ancient Japan. In the Imperial Library of Tokyo there are no less than 2000 written and printed Japanese mathematical works extending back to the year 1595; and it is scarcely remarkable that the determination of the "Ludolphian Number" (π) played a prominent part in the thoughts of early Japanese mathematicians. In 1627 the approximation $79/25$ was known, while in the second half of the seventeenth century values had been obtained which are correct to 9 or 10 places. The well known value $355/113$ was known in 1709, and in 1722 and 1739 values correct to 49 and 51 places had been found. Among the early "circle squarers" Kowa Seki (1642-1708) occupied a leading place.

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His methods, which were applicable to circular arcs generally, depended on successive bisection, but in solving the quadratic equations by means of series the binomial expansion of the square root was used. During the eighteenth century four series for π were known to Naomaro Ajima, who also dealt with the ellipse. At the beginning of the nineteenth century Enzo Wada was acquainted with the catenary and cycloid, and it now appears proved that Seki and his immediate successors studied the binomial theorem, theory of numbers, the properties of maxima and minima, determinants, and spherical trigonometry. Of geodetical observations we have records dating from 1613, and these culminated in the measurements of arcs of the meridian by Ino Chupei (?) in 1800-1818. On the other hand, even as late as 1895, Prof. Harzer finds complaints of the neglect of higher mathematical study in Japan. The question as to how far the ideas of the early Japanese mathematicians were imported from the west through the medium of the Dutch trading ships or other means occupies a prominent part in Prof. Harzer's dissertation.

THE twenty-fifth number (n.s.) of the *Transactions of the Oxford University Junior Scientific Club* contains, in addition to a list of the officers and new members and balance sheet, a paper by Mr. A. F. Walden on some recent views on the constitution of inorganic compounds, which gives an account of Werner's ideas as to the nature of complex cobalt and chromium salts. Mr. A. S. MacNalty deals with trypanosomiasis and sleeping sickness.

In No. 18 of the *Revue générale des Sciences* M. Bernard Brunhes, director of the Observatory of Puy-de-Dôme, gives an interesting account of recent work on terrestrial magnetism in central France. Notice is taken of the anomalies met with by workers in other countries, and particular emphasis is laid on the tendency of magnetic rocks to produce these effects. The Puy-de-Dôme affords an especially good example of the influence of magnetic rocks on the terrestrial magnetism of a district. A description is given of the method adopted in measuring the declination and inclination due to the permanent magnetisation of the specimens of rock selected for experiment.

THE delegates of the Clarendon Press, Oxford, have published in pamphlet form, at sixpence net, an addendum to Mr. J. Cook Wilson's "On the Traversing of Geometrical Figures," which was reviewed in the supplement to our issue of October 19 (p. vi).

WE have received from Messrs. A. Gallenkamp and Co., Ltd., of Sun Street, Finsbury Square, London, a copy of the fifth edition of their general chemical and scientific apparatus catalogue, which has been arranged to meet the requirements of the session 1905-6. The catalogue runs to 534 pages, and is profusely illustrated with clear and helpful illustrations. The arrangement of prices and details of sizes and similar facts in a simple tabular form throughout, and the concisely expressed descriptions of the forms of apparatus available, reduce the trouble of reference to a minimum. There is a good index provided also. Special attention may be directed to the section giving particulars of many forms of electrochemical apparatus, which should prove of interest to teachers and students of electrochemistry. The catalogue is worth examination by teachers who have charge of chemical and physical laboratories, and also by men of science engaged in research work. The excellence of this and other similar catalogues which have come before us recently is instructive evidence of the progress which has been made in the teaching of science in our schools and colleges.